

# MATERIAL SAFETY DATA SHEET

**SRM Supplier:** National Institute of Standards and Technology  
Standard Reference Materials Program  
Bldg. 202 Rm. 211  
Gaithersburg, Maryland 20899

**SRM Number:** 3110  
**MSDS Number:** 3110  
**SRM Name:** Cerium Standard Solution  
**Date of Revision:** 13 July 2000

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## SECTION I. MATERIAL IDENTIFICATION

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**Material Name:** Cerium Standard Solution

**Description:** SRM 3110 is a single element solution prepared gravimetrically to contain a nominal 10 mg/g of cerium with a nitric acid volume fraction of 10 %.

**Other Designations:** **Cerium in Nitric Acid** (aqua fortis; hydrogen nitrate; azotic acid; engravers acid); **\*Cerium Nitrate** (cerium trinitrate; cerium (III) nitrate; cerous nitrate; cerium (III) salt) in **Standard Solution**.

Name	Chemical Formulas	CAS Registration Numbers
Nitric Acid	HNO <sub>3</sub>	7697-37-2
Cerium Nitrate	Ce(NO <sub>3</sub> ) <sub>3</sub>	10108-73-3
Cerium	Ce	7440-45-1

**DOT Classification:** Nitric Acid Solution, UN2031

**Manufacturer/Supplier:** Available from a number of suppliers

\*The addition of cerium to nitric acid, along with other intermediate chemical reactions, forms cerium nitrate which will precipitate upon evaporation or drying of the solution.

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## SECTION II. HAZARDOUS INGREDIENTS

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Hazardous Components	Nominal Concentration (%)	Exposure Limits and Toxicity Data
Nitric Acid	10	ACGIH TLV-TWA: 2 mg/kg or 5 mg/m <sup>3</sup>
		OSHA TLV-TWA: 2 mg/kg or 5 mg/m <sup>3</sup>
		Human, Oral: LD <sub>50</sub> : 430 mg/kg
Cerium Nitrate	2.33	No TLV-TWA established.*
		Rat, Oral: LD <sub>50</sub> : 3154 mg/kg
Cerium	1	No TLV-TWA established.*

\*The suggested ACGIH TLV-TWA for particulates not otherwise regulated is: 10 mg/m<sup>3</sup> for total dust.

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### SECTION III. PHYSICAL/CHEMICAL CHARACTERISTICS

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Nitric Acid	Cerium Nitrate	Cerium
<b>Appearance and Odor:</b> a white to slightly yellow liquid that darkens to a brownish color upon aging and exposure to light; a strong, pungent odor	<b>Appearance and Odor:</b> colorless crystals, deliquescent	<b>Appearance and Odor:</b> gray solid
<b>Relative Molecular Mass:</b> 63.02	<b>Relative Molecular Mass:</b> 326.13	<b>Relative Atomic Mass:</b> 140.12
<b>Density:</b> 1.054 (10 % nitric acid)	<b>Density:</b> not available	<b>Density:</b> 6.689 to 6.770
<b>Solubility in Water:</b> soluble	<b>Solubility in Water:</b> soluble	<b>Solubility in Water:</b> decomposes
<b>Solvent Solubility:</b> decomposes in alcohol	<b>Solvent Solubility:</b> soluble in acetone and alcohol	<b>Solvent Solubility:</b> soluble in dilute mineral acids; <b>insoluble in alkali</b>

**NOTE:** The physical and chemical data provided are for pure compounds. Physical and chemical data for this cerium/nitric acid solution do not exist. The actual behavior of this solution may differ from the individual components.

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#### SECTION IV. FIRE AND EXPLOSION HAZARD DATA

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**Flash Point:** N/A

**Method Used:** N/A

**Autoignition Temperature:** N/A

**Flammability Limits in Air (Volume %):**      **UPPER:**      N/A

**LOWER:** N/A

**Unusual Fire and Explosion Hazards:** Although nitric acid does not burn, it is a powerful oxidizing agent that can react with combustible materials to cause fires.

**Extinguishing Media:** Use extinguishing media that is appropriate to the surrounding fire. Use a water spray to dilute nitric acid and to absorb liberated oxides of nitrogen.

**Special Fire Procedures:** Fire fighters should wear a self-contained breathing apparatus (SCBA) with a full face piece in the pressure demand or positive mode and other protective clothing.

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## SECTION V. REACTIVITY DATA

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**Stability:**                        X   Stable                             Unstable

**Conditions to Avoid:** Avoid contact with heat or incompatible materials.

**Incompatibility (Materials to Avoid):** Keep nitric acid away from organic materials, plastics, rubber, and some forms of coatings. Nitric acid is incompatible with chlorine, metal ferrocyanide, and ferrocyanide. Cerium nitrate is incompatible with combustible materials and reducing agents.

See Section IV: *Unusual Fire and Explosion Hazards*.

**Hazardous Decomposition or Byproducts:** Hazardous decomposition of nitric acid can produce various nitrogen oxides, including nitric oxide (NO), nitrogen dioxide (NO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O), as well as nitric acid mist or vapor. Thermal decomposition of cerium nitrate will produce toxic oxides of nitrogen.

**Hazardous Polymerization:** \_\_\_\_\_ Will Occur      **X**      Will Not Occur

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**SECTION VI. HEALTH HAZARD DATA**

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**Route of Entry:**       X   **Inhalation**                       X   **Skin**                       X   **Ingestion**

**Health Hazards (Acute and Chronic): Nitric Acid:** Nitric acid may be fatal if inhaled, swallowed, or absorbed through the skin. This material causes burns and is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin. Inhalation may be fatal as a result of spasm, inflammation, and edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.

**Cerium and Cerium Nitrate:** Cerium and cerium nitrate may be harmful by inhalation, ingestion, or skin absorption. Exposure may cause irritation to skin, eyes, mucous membranes, and upper respiratory tract. Inhalation of sufficient amounts may cause itching, sensitivity to heat, and an increased awareness of odor and taste. The oral toxicity of the rare earth metals and salts is low due to poor gastrointestinal absorption. Ingestion may result in tearing, diarrhea, and liver damage. Eye contact may cause conjunctivitis. Skin contact may lead to hair loss. Nitrates may cause dermatoses, if absorbed through the skin.

**Medical Conditions Generally Aggravated by Exposure:** Eye disorders, skin disorders, respiratory disorders, and allergies.

**Listed as a Carcinogen/Potential Carcinogen:**

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens	<u>          </u>	<u>  X  </u>
In the International Agency for Research on Cancer (IARC) Monographs	<u>          </u>	<u>  X  </u>
By the Occupational Safety and Health Administration (OSHA)	<u>          </u>	<u>  X  </u>

**EMERGENCY AND FIRST AID PROCEDURES :**

**Skin Contact:** Remove contaminated shoes and clothing. Rinse affected area with large amounts of water followed by washing the area with soap and water. Watch for chemical irritations and treat them accordingly. Obtain medical assistance if necessary.

**Eye Contact:** Immediately flush eyes, including under the eyelids, with copious amounts of water for at least 15 min. Obtain medical assistance.

**Inhalation:** If inhaled, move the victim to fresh air. If breathing is difficult, give oxygen; if the victim is not breathing, give artificial respiration. Obtain medical assistance if necessary.

**Ingestion:** If ingestion occurs, wash out mouth with water. **DO NOT** induce vomiting. Obtain medical assistance immediately.

**NOTE (Nitric Acid):** Wash affected skin areas with 5 % solution of sodium bicarbonate ( $\text{NaHCO}_3$ ). If ingested, the risk versus the benefit of the passage of a naso-gastric tube is debatable. Activated charcoal is of no value. **DO NOT** give the exposed person bicarbonate to neutralize the material.

**TARGET ORGAN(S) OF ATTACK:**     **Nitric Acid:** skin, teeth, eyes, and upper respiratory tract  
   **Cerium Nitrate:** respiratory system, liver, and skin

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**SECTION VII. PRECAUTIONS FOR SAFE HANDLING AND USE**

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**Steps to be Taken in Case Material Is Released or Spilled:** Notify safety personnel of spills. Surfaces contaminated with spills should be covered with soda ash or sodium bicarbonate to neutralize the acid. Place the neutralized material into containers suitable for eventual disposal, reclamation, or destruction.

**Waste Disposal:** Follow all federal, state, and local laws governing disposal.

**Handling and Storage:** Provide general and local explosion proof ventilation systems to maintain airborne concentrations below the TLV. Provide approved respiratory apparatus for nonroutine or emergency use. Use an approved filter and vapor respirator when the vapor or mist concentrations are high. Wear gloves and chemical safety glasses where contact with the liquid or high vapor concentrations may occur. An eye wash station and washing facilities should be readily available near handling and use areas. Wash exposed skin areas several times a day with soap and warm water.

**NOTE:** Contact lenses pose a special problem; soft lenses may absorb irritants and all lenses concentrate them. **DO NOT** wear contact lenses in the laboratory.

Store this material at room temperature.

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**SECTION VIII. SOURCE DATA/OTHER COMMENTS**

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**Sources:** MDL Information Systems, Inc., MSDS *Cerium*, 10 September 1998.  
MDL Information Systems, Inc., MSDS *Cerous Nitrate*, 10 September 1998.  
MDL Information Systems, Inc., MSDS *Nitric Acid*, 02 June 1999.  
The Merck Index, 11th Ed., 1989.  
The Sigma Aldrich Library of Chemical Safety Data, Ed. II, 1988.

**Disclaimer:** Physical and chemical data contained in this MSDS are provided only for use in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data on the MSDS. The certified value for this material is given in the NIST Certificate of Analysis.